



## Surface Study Covers More Ground

The opportunity to study arena footing was a natural leap to take for University of Guelph researcher, Dr. Jeff Thomason, given his extensive involvement researching track surfaces. “Meeting Karen Leeming, co-owner of Footing First, whilst attending the first Equi-Challenge event was serendipitous,” says Thomason. Footing First has initiated a two to three year scientific study involving noted

researchers Dr. Jeff Thomason, Dr. Mick Peterson and others to look at the effects of footing surfaces on show jumping horses. Results are intended to assist footing designers in reducing the chances of injuries to horses as they create their next generation of products.

Thomason intends to gather data on top show jumpers performing on a variety of different footings: sand with and without additives (such as fibre and rubber particles), turf, and even a surface with an under mat (which waters the surface from below)! Sensors on the hoof will measure hoof slip, concussion and loading using the same horses and riders. In an earlier study of concussion and mid-stance loading, Thomason and student Katie Gallagher found that jumping horses bring their front legs closer together on landing resulting in more force on the lateral quarter of

each foot. An interesting side project will include riders giving feedback of their perception on how each surface feels. Moisture content of the different surfaces will also be studied during the summer of 2012.

When asked to identify the main challenges for creating optimal footing, “Riding surfaces need to provide cushion, be able to bring the foot to a halt fairly quickly while also allowing the foot to cut into the surface allowing torque,” explains Thomason, “Part of good maintenance includes preventing compaction and loss of cushion through regular harrowing.”

Footing First has funded Thomason’s research on this project and will help arrange horses and riders for studies both in Florida and throughout Ontario. The company is in the process of seeking matching funds for ongoing research.

By – Jackie Bellamy



Part of good surface maintenance includes preventing compaction and loss of cushion through regular harrowing.

Welcome to another bi-annual report on the ground-breaking research funded by partners, sponsors and a growing number of donors to Equine Guelph’s Research Program. This issue brings you news of expanding surface studies, progress in stem cell therapy, the benefits of shock wave treatment, developments toward finding a Rhodococcus vaccine, genomic research in the areas of respiration and reproduction, biosecurity on horse farms and the use of electrolytes. The last page announces upcoming Equine Guelph programs to help horse owners combat colic. Enjoy and learn!

Dr. Jeff Thomason, Co-Chair,  
Equine Guelph Research Committee

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of GUELPH

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CHANGING LIVES  
IMPROVING LIFE

## Full Speed Ahead Toward *R. equi* Vaccine Development

Research aimed towards *Rhodococcus* vaccine development continues to gain momentum with University of Guelph researcher, Dr. John Prescott, working in collaboration with Ph.D. student, Iain MacArthur at the University of Edinburgh in Scotland. Thanks to the advances brought about by genomic research, the team has been able to identify the most “switched on” genes in the *R. equi* bacterium and come up with an improved process to mutate targeted genes (for example the “LSR” gene) to the point where the bacteria will no longer survive. Advances have been made in the screening process with hundreds rather than thousands of potential mutants to screen.

The Edinburgh group has also developed an important mouse model for immunization and bacterial challenge. MacArthur has achieved a 99% reduction in the bacterial count of *R. equi* in immunized and then challenged mice.

With the advances in this research, Prescott can foresee development of a new vaccine within the next three years. Funding for this research project has been provided by the Horse Race Betting Levy Board and Equine Guelph.



Photo: Brian Stevens

Airborne *R. equi* hides in the macrophages which normally destroy invading bacteria. *R. equi* has taken over this foal's lungs resulting in suffocation.

## Advances in Differentiating Cells for Regenerative Therapy

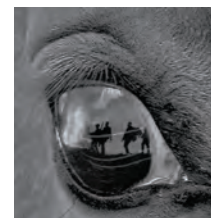
University of Guelph researcher Dr. Koch is optimistic that advances in his stem cell research are bringing his team closer to in vivo studies. Satisfactory cartilage repair has not been achieved using undifferentiated cells. Priming the cells to become cartilage cells prior to implantation may improve treatment outcome, but coming up with enough cells for use in vivo is a challenge. The new membrane-based culture system will yield better quality cells in higher numbers.

Progress has been made to develop a way to track the cells once they are injected into a live horse. MRI technology has enabled the tracking of

the stem cells for a week after injection into tendon specimens.

Dr. Thomas Koch is an assistant professor in the Department of Biomedical Sciences at the Ontario Veterinary College and an adjunct associate professor in the Orthopedic Research Lab at Aarhus University in Denmark. His work is funded by the Danish Research Agency for Technology, Production and Innovation, Grayson Research Foundation of Lexington, Kentucky, BioE Inc. of Minnesota, SentrX Animal Care Inc. of Utah, Morris Animal Foundation, and Equine Guelph.

## We Need Your Help to 'Help Horses for Life'



The celebration of 'War Horse' continues when you give to the Equine Guelph OEF 'War Horse' Welfare

Education Fund created to improve equine welfare education as it applies in today's world. Equine Guelph, working together with the horse industry, will develop new courses that will teach the highest degree of skills in horse care and welfare and contribute to the reduction of welfare issues.

“Your donation to Equine Guelph helps fund groundbreaking work that is making a significant difference in the lives of our horses. We truly appreciate your support,” Gayle Ecker, director, Equine Guelph.

Donations to Equine Guelph can be made online (<http://uofg.convio.net/eg>), by phone (1-519-824-4120 ext. 54431) or by mail using credit card (VISA or Mastercard) or cheque. Please make cheques payable to University of Guelph/Equine Guelph. An official tax receipt will be sent for donations (online donations will receive an immediate e-receipt).

There are many different ways to give: cash gifts, planned giving, gifts-in-kind, hosting a fundraiser, or volunteering your time. Equine Guelph also offers a tribute program, Hoofprints, to honour deceased horses or people. **Donate today at [www.EquineGuelph.ca](http://www.EquineGuelph.ca)**

# Shock Waves for Speedy Healing



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Dr. Judith Koenig began studying shock wave treatment when a particular horse with a broken leg came in for

treatment. Koenig was interested in all the work that had been done in humans using shock wave therapy and preceded with her studies using a wound healing model.

Koenig has found shock wave treatment beneficial in reducing proud flesh in large wounds, if used immediately after injury occurs. “Although the treatment is expensive, savings can be realized in reducing stall rest time and eliminating the cost of treating proud flesh after wound healing,” says Koenig. Horses are known to have a long and weak

inflammation phase post-injury, especially in their limbs. Koenig believes that shock waves work in wound and tendon healing by inducing a stronger inflammation in the tissue which results in a shorter healing time. Although it is not fully understood how shock wave treatment works, the theory is shockwaves are acoustic waves that are created by a shockwave generator and travel through fluid in the shockwave head. These acoustic waves create shear forces when they meet tissue of a different density (i.e. tendons) which release gas bubbles on the cell surface and release inflammatory mediators and growth factors. Koenig’s challenge has been attempting to measure the up and down regulation of growth factors to explain the research results. Funding for this research has been provided by a grateful thoroughbred owner, who donated the equipment, and through Equine Guelph.

*By – Jackie Bellamy*

## Shock wave benefits:

- Speeds healing of wounds
- Reduces down time
- Early treatment is key



*Photo: Dr. Judith Koenig*

The right front leg was treated with shockwave; the left front leg was used as untreated control. Note the amount of proud flesh formation in the untreated leg.

## The Value of Research for the Health and Welfare of Your Horse

As I write, the diverse and successful equine industry is moving into unknown and very uncertain territory. I do not want to belittle the likely impact on many businesses and individuals, but I do want to deliver a positive message, and possibly a little hope. We, at Equine Guelph and at the University of Guelph have been discussing what we can offer to a redeveloping industry. Even if we focus on research for the purposes of this

newsletter, we can and will continue to contribute through several programs including the many educational and training opportunities.

To date, most of the research supported through Equine Guelph has been on the health and welfare of the horse itself. What will be added to that in the near future is research on the health and welfare of the equine industry (how

much research is done will greatly depend on funding availability). The aim will be to find or generate information of direct use to individuals, businesses and associations as they adjust. I hope that we will start reporting some success stories based on this research, perhaps as early as next year.

*-By: Dr. Jeff Thomason, Co-chair, Equine Guelph Research Committee*

# Maximizing the Benefits of Genomic Research on C

In a major step towards combating issues affecting equine reproduction and respiration, researchers at the University of Guelph have identified a protein called Clara cell secretory protein (CCSP) that may assist in developing better defence systems when it comes to treatment and prevention of different diseases in horses.

The initial release of the horse genome database in 2007 has provided scientists with completely new information pertaining to horses' genes. This, along with the associated technologies in identifying proteins controlled by the genes, has since then greatly benefitted veterinary researchers working on equine health and disease.

## In Respiratory Research

Working as a main anti-inflammatory protein, CCSP appears to play a critical role in the defence against airway disease in mammals, and Dr. Dorothee Bienzle, professor in the Department of Pathobiology at the Ontario Veterinary College (OVC), is currently studying the effects of this key protein and the role it can play in determining and treating Recurrent Airway Obstruction (RAO) in horses.

A chronic inflammatory lung disease, RAO is commonly referred to as heaves and affects up to 50% of horses worldwide. It is typically caused by an allergic-type of reaction following repeated exposure to environmental substances associated with poor quality hay or bedding. Even though this disease has been recognized for centuries, current treatment for horses with RAO is limited, resulting in affected horses being unable to race or compete.

While environment plays a key role in RAO, Bienzle believes that this disease could also develop in older horses that had suffered severe respiratory virus infections as youngsters. Even after overcoming the viral infection, a certain proportion of these horses end up developing this asthma-like condition later on in life, which, at this stage is very difficult to treat and is essentially impossible to reverse.

“We believe that some horses which suffer severe viral respiratory infections as youngsters, with organisms such as herpesvirus, influenza virus, or rhinovirus, will develop a condition called ‘inflammatory airway disease’ (IAD),” says Bienzle. “Basically, the lining of the airways becomes inflamed, and some horses that have IAD never ‘reset’ their airway epithelium to the right balance of reacting to environmental stimuli and suppressing reactions. We believe those horses that remain prone to exaggerated inflammatory response are very likely to develop heaves.”

Bienzle has discovered that the CCSP that is naturally produced in the lower bronchi plays an important role in counteracting lung inflammation in horses with RAO. In identifying the role of the protein they are studying, Bienzle explains that this will help researchers to better understand how the airway defends itself against environmental stimuli, enabling them to properly diagnose and better treat the condition.

“We recognize CCSP as a main anti-inflammatory protein, but we don't really know how it works,” explains Bienzle. “We would like to know whether it works in defending the airway epithelium (tissue which lines the respiratory tract) against viruses, inhaled particles, bacteria and/or other stimuli. We would also like to know how it decreases airway inflammation.”

## In Reproduction Research

While it has been found that the majority of CCSP is produced in the horse's conducting airway, University of Guelph researchers have also discovered important changes pertaining to key proteins that are involved in similar interactions between the uterus of the mare and the early developing embryo.

Dr. Keith Betteridge, Department of Biomedical Sciences and Dr. Tony Hayes, Department of Pathobiology, both professors at the OVC, came together eight years ago with a common goal of reducing early pregnancy loss in mares.

Nearly 17% of diagnosed pregnancies fail to produce a foal, and about 60% of the failures occur within the first five weeks of pregnancy. Both Betteridge and Hayes are focused on identifying the changes in molecules that are produced in the uterus in mares, including proteins that play a critical role in the failure of early pregnancy, as well as in infertility due to inflammatory processes.



Top right photo: EM\_CC: Scanning cells with round surface are embedded in mucus are attached to the surface

# Clara Cell Secretory Protein



Scanning electron micrograph of a bronchiole from a horse. Clara cells are embedded amidst ciliated epithelial cells. Small amounts of Clara cells and the cilia of the epithelial cells.

They feel that identifying these key molecules will assist in the development of early diagnostics and in creating new treatments for infertility.

“It would be very nice to be able to reduce the numbers of failed pregnancies,” explains Betteridge. “And to be more specific, when we have systems that age the horse from the 1st of January for example, it is very important to get mares pregnant early in the season; being able to prevent pregnancy loss would go a long way towards meeting that goal.”

Genomic research has equipped the veterinary researchers with the ability to identify many proteins by mass spectrometry and has revolutionized their ability to analyze the proteins in detail, as they study fertility and infertility in horses. It is details like these that guide researchers to the next ‘growing point’ of the continuous research process.

The researchers note that there is much more to learn about early pregnancy, and by studying CCSP, they will have a better idea of what can go wrong in early pregnancy.

“If we are able to identify the key molecules that are produced in mares, we will be able to do two things,” says Hayes. “We will be able to hopefully develop a test which will help us measure the potential for that particular mare to get pregnant and may be able to use particular treatments that counteract the nasty effects of some of these proteins and therefore settle down the inflammatory response and make pregnancy more likely to occur earlier.”

While genomic research has revolutionized the ability to identify the production of thousands of proteins, Hayes notes it can also be bewildering at times because researchers are confronted suddenly with huge amounts of new information about what’s happening during these critical events. It then takes some time to analyze all of these activities and the locations of protein production.

“There are a lot of the proteins controlled by these genes that have been identified in parallel with what has been known in other species, but still there are many, many genes that are poorly understood in the horse, and I think it will be another five or ten years before the full depth of genomic information will be available for researchers like us,” says Hayes. “But nonetheless, there are many, many helpful items that we can follow now with regard to reproductive health that will be of benefit to the industry.”

Funding for these research projects have been provided by Equine Guelph, Grayson Jockey Club Research Foundation, Natural Sciences and Engineering Research Council of Canada (NSERC), Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph.

By – Barbara Sheridan



**Trouble accessing QR codes? Get the free mobile app at <http://gettag.mobi> or access Equine Guelph research videos on YouTube by visiting: <http://www.youtube.com/user/EquineGuelphUofG/videos?view=1>**

# How Can Horse Farms Practise Biosecurity?



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Biosecurity in the horse industry can be a difficult concept to comprehend, and put into practice, especially when the average horse frequently travels off property or encounters horses that have been off the farm. However, lack of infection control procedures can leave a barn vulnerable to all kinds of diseases. Important preventative steps to discuss with your veterinarian can include cleaning, disinfection, considerations to make when moving horses around and testing of horses when they become sick. According to University of Guelph researcher and author of the “Worms and Germs” blog, Dr. Scott Weese, “having a basic infection control plan in place is probably the biggest thing someone can do to reduce the risk of disease.” Weese goes on to stress, “It does not matter what you do with your horse(s), or whether you have only one horse or a herd of 100, as an owner you should have a general idea of the measures you are going to take in order to reduce the risk of infection.” Weese has been working in the area of biosecurity and infection control for over 15 years trying to find better ways to prevent and treat infectious diseases with a strong emphasis on prevention.

Weese and Dr. Maureen Anderson of the Ontario Veterinary College's Centre for Public Health and Zoonoses have been tracking diseases and infections all over the world. For the last three years they have been posting helpful information for horse and pet owners, first with “equIDblog” and now via the “Worms and Germs Blog.” Keeping tabs on emerging diseases in the area is valuable information when discussing the importance and timing of a vaccination program with your veterinarian. This will help ensure the program is a good fit for the needs of your horse. Although, Weese cautions that vaccination should not be the only biosecurity practice horse

**Report on RESEARCH**

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presented by **EQUINE GUELPH**

**topic:** WHAT IS BIOSECURITY IN HORSE FARMS?

**researcher:** **Dr. Scott Weese** DVM, DVSc Guelph; Dipl ACVIM | Professor Pathobiology, Ontario Veterinary College, University of Guelph

owners engage in.

Any time a horse goes off the farm and encounters other horses it has a chance of contracting an infectious disease. **A few ways to lower those risks include: avoiding nose to nose contact, not sharing water buckets and grooming equipment, and avoid having people who are handling other horses handle your horses.**

Ideally, a horse that leaves the farm and is exposed to other horses should come home to a quarantine protocol to reduce the chances of spreading infections to the entire herd. Although this is not always possible, consideration should be given to keeping the housing separate for horses that travel frequently, especially if you also keep horses at greater risk of infection such as broodmares or foals.

Weese was the first speaker at the launch of Equine Guelph's “Beat the Bugs” biosecurity workshops and says, “These workshops are great for getting people thinking in a broader context when it comes to infection control and putting into practice the easy day to day steps which can reduce outbreaks of disease.”

To learn more about protecting your horse from infectious disease - sign up for Equine Guelph's upcoming Biosecurity workshops.

By – Jackie Bellamy

## BIOSECURITY WORKSHOPS

**Grand River Raceway, Elora**  
September 6, 1 - 3pm

**University of Guelph, Guelph**  
September 13, 5 - 7pm

**Woodbine Racetrack, Toronto**  
September 25, 1 - 3pm

**Best Western Inn, Orangeville**  
September 27, 1 - 3pm

**Equine Guelph's eWorkshop**  
Oct 22 to Nov 4

**Sign up at:**  
[www.EquineGuelph.ca/biosecurity.php](http://www.EquineGuelph.ca/biosecurity.php)

## OEF Contributes to Research

A generous \$10,000 donation made by the Ontario Equestrian Federation to Equine Guelph has been allocated to research involving respiratory health and digestive track health. Dr. Dorothee Bienzle is studying etiologic agents and their interaction with macrophages in heaves. Dr. Scott Weese is studying genetic characteristics of equine intestinal bacteria. Equine Guelph looks forward to bringing you updates.

## Eye Opener for Electrolyte Use

Most horse owners have used a skin pinch test to assess hydration in a horse. University of Guelph professor, Dr. Mike Lindinger cautions this qualitative approach can not only give a false negative but may also be too-little-too-late as clinical dehydration may already be occurring at the point when skin tenting is apparent.

Lindinger first became involved with studying electrolyte balance in horses 20 years ago after meeting potential M.Sc. student Gayle Ecker, current director of Equine Guelph. Ecker introduced Lindinger to elite equine athletes in the world of endurance riding and eventing. Riders know first-hand the damaging effects that can result from dehydration, a condition when sweating exceeds drinking. However, the amount of salt a horse loses in sweat is far greater than their human counterparts. Horses can lose up to 10 – 15 litres of water an hour. Lindinger explains, “Drinking plenty of water after exercise is NOT enough!” Prolonged exercise results in loss of electrolytes and depleted glycogen levels which contribute to muscle soreness and poor performance. When there is dehydration, consequences can be as serious as lack of appetite, colic, physical injury, heat strain, hyperthermia, cardiovascular impairment and kidney damage.

Simply replacing water is not sufficient due to the high concentration of electrolytes that a horse loses during sweating (including sodium, potassium, chloride, magnesium and calcium). Water given during or after exercise dilutes the body fluid compartments and is excreted because the body senses it as



Horses can lose up to 10 – 15 litres of water an hour. Drinking plenty of water after exercise is NOT enough!

volume overload. Giving electrolytes again after exercise helps restore those essential nutrients lost during sweating.

Lindinger and Ecker, with the help of Buckeye Nutrition, have produced the only scientifically developed and tested electrolyte supplement. Their study monitored the performance of horses on a treadmill with and without use of the electrolyte supplement. They showed that when horses received electrolyte supplement one hour before exercise the horses could perform at a fast trot for a 27% longer duration than the control group. The research also measured the rate of gastric emptying and intestinal absorption into the blood. Gamma

camera imaging was used to track gastric emptying and showed the electrolyte supplement emptied from the stomach as quickly as water. Through blood testing it was discovered the supplement, given one hour prior to exercise, was being absorbed into the blood within 10 minutes of administration. Muscle biopsies showed that potassium was taken up by this tissue, and sweat analysis showed appearance of sodium from the supplement, indicating that supplemented electrolytes replace those lost through sweating. Electrolytes moderate many body functions including firing of nerves and contracting of muscles.

Lindinger's studies have included working with three-day event horses and endurance horses (most notably before the games in Atlanta) but high performance horses are not the only ones at risk for dehydration. Transport stress can also result in dehydration. Lindinger says one of the first signs of dehydration is usually behavioural, as the horse becomes less responsive. His studies conclude that giving electrolytes before situations likely to cause dehydration will be beneficial to overall performance and help guard against the serious effects of dehydration. Funding for Mike Lindinger's research has been provided by the American Endurance Rider's Conference, Buckeye Nutrition, Equine Guelph, Natural Sciences and Engineering Research Council of Canada, Ontario Ministry of Agriculture, Food and Rural Affairs and United States Equestrian Federation Equine Health Research Fund.

*By – Jackie Bellamy*

# Combat Colic



Photo: Jackie Bellamy

EquiMania!s life-size model of the 85'-long digestive system shows why horses are prone to colic.

Colic is the #1 killer of horses (other than old age), and Equine Guelph has announced a new program to help horse owners battle colic through prevention. Stay tuned for:

- 1) **Colic Exhibit** – visit the *EquiMania!* display featured at the Royal Agricultural Winter Fair from Nov. 2 – 11, 2012
- 2) **'Colic Risk Rater' Online Tool** – available on Equine Guelph's website Feb. 2013
- 3) **Colic Prevention eWorkshop** – two-week online short course will be offered Mar. 2013

Thank you to all who are contributing to our colic survey; your input is integral in helping us develop these programs. For in-depth survey results, go to [www.EquineGuelph.com/education/colic](http://www.EquineGuelph.com/education/colic).

Investment in this project has been provided by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (CAAP). In Ontario, this program is delivered by the Agricultural Adaptation Council.

Thanks to the following animal health care companies for sponsoring the educational, interactive tools at [www.EquineGuelph.ca](http://www.EquineGuelph.ca).



Vaccination Equi-Planner



Lameness Lab & Journey through the Joints



Biosecurity Risk Calculator

# Colic and Biosecurity eWorkshops Coming Soon!

Equine Guelph makes updating your horse knowledge easy with its new informative two-week online short courses providing the latest evidence-based information available.

Horse enthusiasts from around the globe enjoyed the first offering of Equine Guelph's eWorkshop on equine biosecurity this past April 2012.

"This course offered extensive information on biosecurity. I believe it to be valuable, and even essential, for anyone who wants to protect and give their horse the best and safest conditions possible." Patty Russen, New York, USA—Student

Watch [EquineGuelph.ca](http://EquineGuelph.ca) for new two week online eWorkshop offerings:  
Biosecurity - Oct. 22 - Nov. 4, 2012  
Colic Prevention - Spring 2013

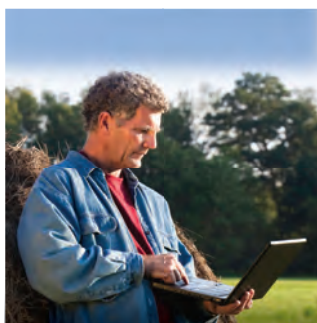
## EVENTS

**Mark your calendar!**

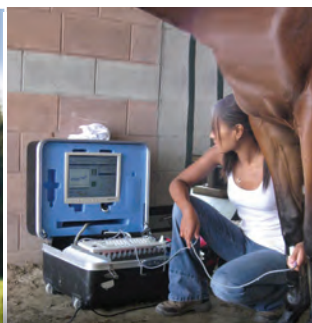
**Royal Agricultural Winter Fair** (EquiMania!) November 2 -11, 2012

**Equine Guelph Online Courses**  
Next offering January 2013

**Anyone wishing to excerpt Equine Guelph should contact:**  
Jackie Bellamy, ext 54205  
[horses@uoguelph.ca](mailto:horses@uoguelph.ca)



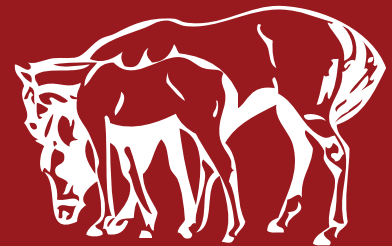
educating horsepeople



funding industry research



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